

REMARKS

In view of the above amendments and following remarks, reconsideration and further examination are requested.

Claims 20 and 22 were rejected under 35 U.S.C. § 102(b) as being anticipated by Miyashita et al.; claims 20, 23 and 24 were rejected under 35 U.S.C. § 102(b) as being anticipated by Miyashita et al. as evidenced by Redeker et al.; claims 20, 23, 24, 26 and 28 were rejected under 35 U.S.C. § 102(b) as being anticipated by Miyazaki et al. as evidenced by Redeker et al.; claims 26-33 were rejected under 35 U.S.C. § 102(b) as being anticipated by Sato et al.; claims 21 and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyashita et al. or Miyashita et al. as evidenced by Redeker et al., in view of Skrovan et al.; and claims 21 and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyazaki et al. as evidenced by Redeker et al. in view of Skrovan.

In reply to the above positions taken by the Examiner, claims 20-33 have been canceled and claims 34-53 have been added.

Claim 34 recites

A substrate processing apparatus, comprising:
a substrate holder for holding a substrate having a copper film thereon;
a processing head having anodes and cathodes, arranged alternately along at least one direction, so as to face the substrate when held by said substrate holder;
a processing liquid supply section for supplying a processing liquid between the substrate, when held by said substrate holder, and said anodes and cathodes; and
a power source for applying a voltage between said anodes and cathodes so as to generate micro-bubbles in the processing liquid when between the substrate and said anodes and cathodes.

Accordingly, the apparatus of claim 34 is designed to apply a voltage between the anodes and the cathodes so as to generate micro-bubbles near a surface of a substrate during processing of the substrate, and can thereby effectively utilize oxidizing power of a created active oxygen species

for processing a copper film on the substrate. As a result, an oxidizing velocity of the copper film can be increased, whereby throughput can be improved.

None of Miyashita et al., Miyazaki et al., Redeker et al., and Sato et al., teaches or suggests an apparatus that is to perform electrolytic processing while creating micro-bubbles in a processing liquid. Specifically, none of these references teaches or suggests a power source for applying a voltage between anodes and cathodes so as to generate micro-bubbles in a processing liquid between a substrate, when held by a substrate holder, and the anodes and cathodes, as required by claim 34. The other relied-upon references do not resolve this deficiency, and accordingly, claim 34 is allowable over the relied-upon references either taken alone or in combination.

Claim 43 is believed to be patentable in its own right because this claim requires an ultrasonic transducer for emitting ultrasonic waves to the processing liquid, when between the substrate and the anodes and cathodes, so as to collapse the micro-bubbles. Application of ultrasonic waves to the micro-bubbles can further improve a removal rate of the copper film. None of the relied-upon references teaches or suggests such an ultrasonic transducer, whereby claim 43 is patentable in its own right.

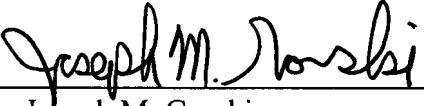
Similarly, claims 44 and 45 are also believed to be patentable in their own right because the subject matter recited therein is not taught or suggested by any of the relied-upon references.

In view of the above amendments and remarks, it is respectfully submitted that the present application is in condition for allowance and an early Notice of Allowance is earnestly solicited.

If after reviewing this Amendment, the Examiner believes that any issues remain which must be resolved before the application can be passed to issue, the Examiner is invited to contact the Applicants' undersigned representative by telephone to resolve such issues.

Respectfully submitted,

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